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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/853,345	05/10/2001	Robert Edward Fontana JR.	ARC920010017US1	7852
30869	7590	01/29/2004	EXAMINER	
LUMEN INTELLECTUAL PROPERTY SERVICES, INC. 2345 YALE STREET, 2ND FLOOR PALO ALTO, CA 94306			MCPHERSON, JOHN A	
			ART UNIT	PAPER NUMBER

1756

DATE MAILED: 01/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/853,345

Applicant(s)

FONTANA ET AL.

20

Examiner

John A. McPherson

Art Unit

1756

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 09 October 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 28-34 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 28-34 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_ 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

***Response to Amendment***

1. This Office Action is responsive to the Amendment filed 10/9/03.
2. The Amendment filed 10/9/03 successfully overcomes the rejections set forth in paragraphs 3-6 of the Office Action dated 7/21/03. Accordingly, these rejections are withdrawn.

***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim 32 is rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,493,926 to Han et al. (Han). Han discloses a method of forming a bi-layer lift-off mask for use in fabricating a MR sensor with a narrow trackwidth of less than 0.5 microns comprising the steps of providing a substrate, forming a GMR layer on the substrate, forming a layer of PMGI on the GMR layer, forming a photoresist layer on the PMGI layer, and patterning and developing the photoresist layer and PMGI layer so as to form a suspension-bridge shaped bi-layer structure, wherein the width of the bridge

portion is between 0.05 microns and 0.5 microns. See the abstract; column 5, lines 55-76; and column 6, lines 51-56. Additionally, Han discloses ion-milling the GMR layer using the bi-layer suspension-bridge structure as an ion-beam milling mask, thereby forming a narrow active region of the GMR layer having sharply defined edges. See column 6, lines 29-36. Ion-beam milling is a highly anisotropic etching method, therefore the resulting pattern (i.e. trackwidth) in the GMR layer would inherently be the same as the width of the resist bridge.

#### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 28-30 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,493,926 to Han et al. (Han) in view of the article "Chemistry of Ketol Resist System and Its Lithographic Performance" by Huang et al. (Huang). The disclosure of Han is discussed above in paragraph 3. Furthermore, with respect to claim 29, Han discloses that the photoresist layer and the PMGI layer are shaped by the application of "a developing solution" (i.e. a single developer for both layers), whereby the PMGI layer is differentially shaped relative to the photoresist layer by application of "the developing solution" (i.e. again, a single developer). See column 4, line 67 to column 5, line 10. However, Han does not disclose utilizing a deep ultraviolet resist as

the material of the photoresist layer. Huang discloses that photolithography has shifted from I-line to deep-UV wavelengths due to the requirement of printing 250 nm images or below, and provides a photoresist composition useful in the deep-UV region. See the first sentence of the article (excluding the abstract). It would have been obvious to one skilled in the requisite art to utilize a deep-uv resist, as taught by Huang, as the photoresist in the process of Han because it is taught that the photolithography art recognizes deep-UV resists are preferable to conventional, near UV photoresists when forming images of 250 nm or less.

5. Claims 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,493,926 to Han et al. (Han) in view of Applicant's discussion of the prior art in the specification. The disclosure of Han is discussed above in paragraph 3. However, Han does not disclose forming a patterned MR layer having a trackwidth to thickness ratio of less than or equal to 4 to 1, or a thickness of the MR layer so that this ratio can be calculated. In the Background Art section of the specification, Applicant states that significant reduction of the GMR layer thickness used in the prior art is not possible. See page 4, lines 24-26. Accordingly, the thickness of the GMR layer in the admitted prior art is the same as in the present invention, 0.04 to 0.06 microns (see page 8, lines 4-9). Han discloses a bridge width, and therefore a resulting trackwidth after ion-beam milling, of as small as 0.05 microns. This would result in a trackwidth to thickness ratio as low as approximately 1:1. It would have been obvious to one skilled in the requisite art to use a MR layer thickness of 0.04 to 0.06 microns, thereby arriving

at trackwidth to thickness ratio of less than or equal to 4:1, as the thickness in the process of Han because it is taught that this is the minimal thickness of the MR layer in the prior art, as admitted by Applicant.

6. Claims 28-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,493,926 to Han et al. (Han) in view of the article "Chemistry of Ketal Resist System and Its Lithographic Performance" by Huang et al. (Huang), further in view of Applicant's discussion of the prior art in the specification. The disclosure of Han in view of Huang is discussed above in paragraph 4. However, neither Han nor Huang disclose forming a patterned MR layer having a trackwidth to thickness ratio of less than or equal to 4 to 1, or a thickness of the MR layer so that this ratio can be calculated. In the Background Art section of the specification, Applicant states that significant reduction of the GMR layer thickness used in the prior art is not possible. See page 4, lines 24-26. Accordingly, the thickness of the MR layer in the admitted prior art is the same as in the present invention, 0.04 to 0.06 microns (see page 8, lines 4-9). Han discloses a bridge width, and therefore a resulting trackwidth after ion-beam milling, of as small as 0.05 microns. This would result in a trackwidth to thickness ratio as low as approximately 1:1. It would have been obvious to one skilled in the requisite art to use a MR layer thickness of 0.04 to 0.06 microns, thereby arriving at trackwidth to thickness ratio of less than or equal to 4:1, as the thickness in the process of Han because taught that this is the minimal thickness of the MR layer in the prior art as, admitted by Applicant.

***Claim Rejections - 35 USC § 102/103***

7. Claim 32 is rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over U.S. Patent No. 6,187,513 to Katakura (Katakura). Katakura discloses a process for forming mask patterns comprising the steps of coating a first resist on a surface, exposing the first resist to form a pattern latent image, coating a second resist on the first resist, exposing the second resist to form a pattern latent image, developing the second resist to form an upper layer mask pattern, developing the first resist to form a lower layer mask pattern, wherein the upper layer mask pattern has a bridge part. See the abstract; column 7, line 4 to column 10, line 13. Furthermore, a device having a line width of 0.5 microns or less can be easily produced using the mask pattern. See column 16, lines 10-20. Accordingly, because the disclosed line width (0.5 microns or less) includes the claimed width range of the present invention (narrower than 0.2 microns), this invention is not novel.

Alternatively, while Katakura does not exemplify an embodiment having a width in the lower portion of the disclosed range, so as to be within Applicant's claimed range, it would have been obvious to one skilled in the requisite art to minimize the line width within the given range so as to arrive at a width of less than 0.2 micrometers, since it has been held that discovering an optimum value of a result effective variable (track width is known to effect the obtainable recording density) involves only routine skill in the art (*In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA)), and it has been held that where the

Art Unit: 1756

general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (*In re Aller*, 105 USPQ 233).

8. Claims 28, 30 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,187,513 to Katakura (Katakura) in view of the article "Chemistry of Ketall Resist System and Its Lithographic Performance" by Huang et al. (Huang). The disclosure of Katakura is discussed above in paragraph 7. Furthermore, Katakura discloses that the resist for forming the mask pattern may be either an electron beam resist or a photoresist. See column 16, lines 37-41. However, Katakura does not disclose utilizing a deep ultraviolet resist as the material of the photoresist layer. Huang discloses the lithography has shifted from I-line to deep-UV wavelengths due to the requirement of printing 250 nm images or below, and provides a photoresist composition useful in the deep-UV region. See the first sentence of the article (excluding the abstract). It would have been obvious to one skilled in the requisite art to utilize a deep-uv resist, as taught by Huang, as the photoresist in the process of Katakura because it is taught that the photolithography art recognizes deep-UV resists are preferable to conventional, near UV photoresists when forming images of 250 nm or less.

### ***Response to Arguments***

9. Applicant's arguments with respect to claims 28-34 have been considered but are moot in view of the new ground(s) of rejection.



Application/Control Number: 09/853,345  
Art Unit: 1756

Page 8

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to John A. McPherson whose telephone number is (571) 272-1386. The examiner can normally be reached on Monday through Friday, 8:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.



John A. McPherson  
Primary Examiner  
Art Unit 1756

JAM  
1/23/04